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Change in smallholder dairy farms in Indonesia, 2010-2014: Farm size, innovation adoption and the role of cooperatives

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Outline

- Background
- Research questions
- Survey
- Preliminary results with particular focus on change in herd size and adoption of innovations
- Concluding remarks and caveat

Indonesian dairy sectors: Mixed stories …

New development

Imports

Background

- Business model - the rationale for how a company creates and structures its relationship to capture value (FAO 2012);
- Smallholder; 192,160 dairy farmers managing about 3 cows each on average

Smallholder-inclusive business models

Four categories of inclusive business models: management contracts (eg tenant farming, sharecropping, etc); joint venture; farmer-owned business; and contract farming (eg the nucleus estate model, etc) (Cotula and Leonard 2010)

Change in Indonesian dairy sector:

- Demand side:
  - Increased income, population, health awareness lead to increased demand for 'liquid milk'; only 13 litres per annum in 2013 << 22 litres in the Philippines and 34 litres in Thailand.
- Supply side:
  - New investments esp fluid milk segment (demand ↑10% pa);
  - Improved governance of dairy supply chains.
  - BEEF trade dynamics between Indonesia and Australia (est dairy cows population: 636,064 to 395,000 in 2013-14).

Herd size has decreased (?)

Patterns; considering farmer's heterogeneity and different arrangements these farmers are involved in

Research questions

Using data from 220 dairy farm households in Sukabumi, Indonesia this study attempts to addresses the following questions:

1. What were the patterns of dairy production between 2010 and 2014 considering farmers' heterogeneity? More specifically, what are factors influencing the growth rate of farm size?
2. To what extent the marketing coordination in particular provision of production input services by cooperatives in dairy supply chains has impacted on production decisions of dairy farmers in Indonesia with particular focus on the period of 2010-2014?

Relevant literature

- On firm size and firm growth (eg Evans 1987; Jia *et al.* 2012) to find evidence for Gebret's Law (i.e. a firm's growth is independent of its initial firm size)
  - Applications in food sectors are quite many; but focus on farm's initial size and farm characteristics as determinants of farm size growth (Weiss 1998; Weiss 1999).
  - Jia *et al.* (2012) include government policies and market access.
  - This study is to take into account: the roles of cooperatives in particular their provision of input and services.
- On the nexus between dairy herd size growth and adoption of innovations.
  - Literature on adoption of innovations tend to focus on either differences between adopters and non-adopters; or the timing of adoption (Besley and Case 1993; Marra et al. 2003).
  - An increasing number of studies that look at the impact of adoption of innovations, for example on technical efficiency (Mayen *et al.* 2010).
  - Another relevant stream of literature is on the relationship between farm size and technical efficiency (Hansson 2008).
  - However, little has been done to see whether *initial* levels of innovation adoption influence the growth of herd size.

Dairy farm household survey

Planning phase (September – November 2014)

- Capacity building workshops
- Focus group discussions with farmers and coop management.
- Build on previous survey tools.

Survey development (November 2014)

- Sampling design
- Training of experienced enumerators
- Pre-testing questionnaires and refining survey tool.

Data collection (December 2014-January 2015)

- >220 dairy households.
- 20-page structured questionnaire
- Data entry: CS Pro, experienced data entry programmer.

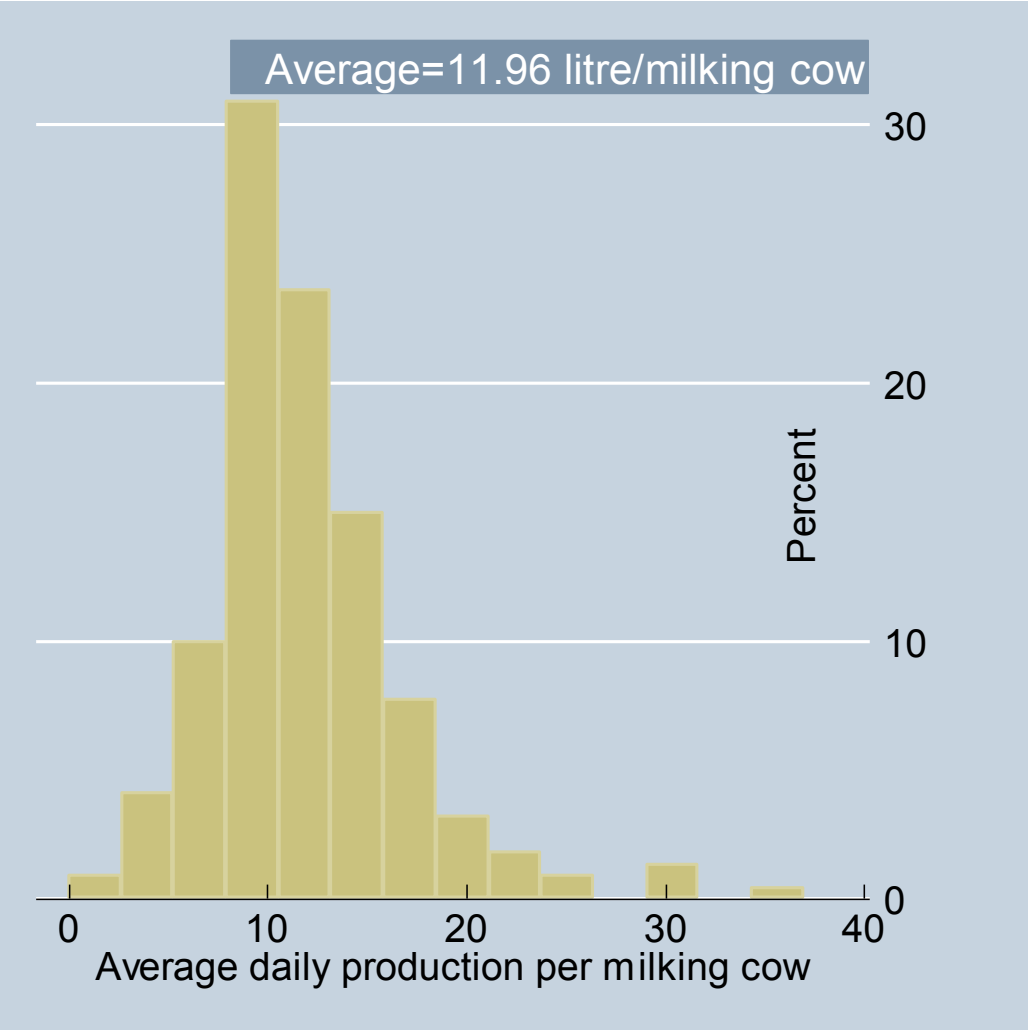
Data Analysis (work in progress)

- Business models
- Adoption of innovations
- Household consumption and nutrition

Descriptive statistics

Variable	Definition	Mean	Standard deviation	Minimum	Maximum
GROWTH	Percentage growth of the number of dairy cows owned by farmers between 2010 and 2014 (%)	7.080	94.991	-83.333	7.080
SIZE	initial herd size (in 2010)	8.745	9.701	0	80
AGE	Years of dairy farming (in 2010)	10.514	8.587	0	31
HH_AGE	The head of household's age	41.664	11.254	17	78
EDUC	The head of household's years of education	6.905	3.408	0	17
MARITAL	Marital status (one if married)	0.955	0.209	0	1
HH_SIZE	Number of householders	3.709	1.480	2	9
INNOVATION	Farm-level adoption of innovation index (between 0 and 20) (in 2010)	5.186	2.825	0	15
YR_SALES	The length of relationship between farmers and their main buyer(years) (in 2010)	8.618	8.271	0	30
CONTRACT	The presence of verbal or written contract between farmers and main buyers (one if exists)	0.388	0.488	0	1
CONCENTRATES	One if the coop supplies concentrates	0.650	0.478	0	1
CREDITS	One if the coop is the main source of capital	0.814	0.390	0	1
DIST_MCC	One if the farmer walks to the nearest milk collection centre	0.541	0.499	0	1
NON_AGRI	One if any member of the household had non-agricultural wage employment in 2010	0.259	0.439	0	1

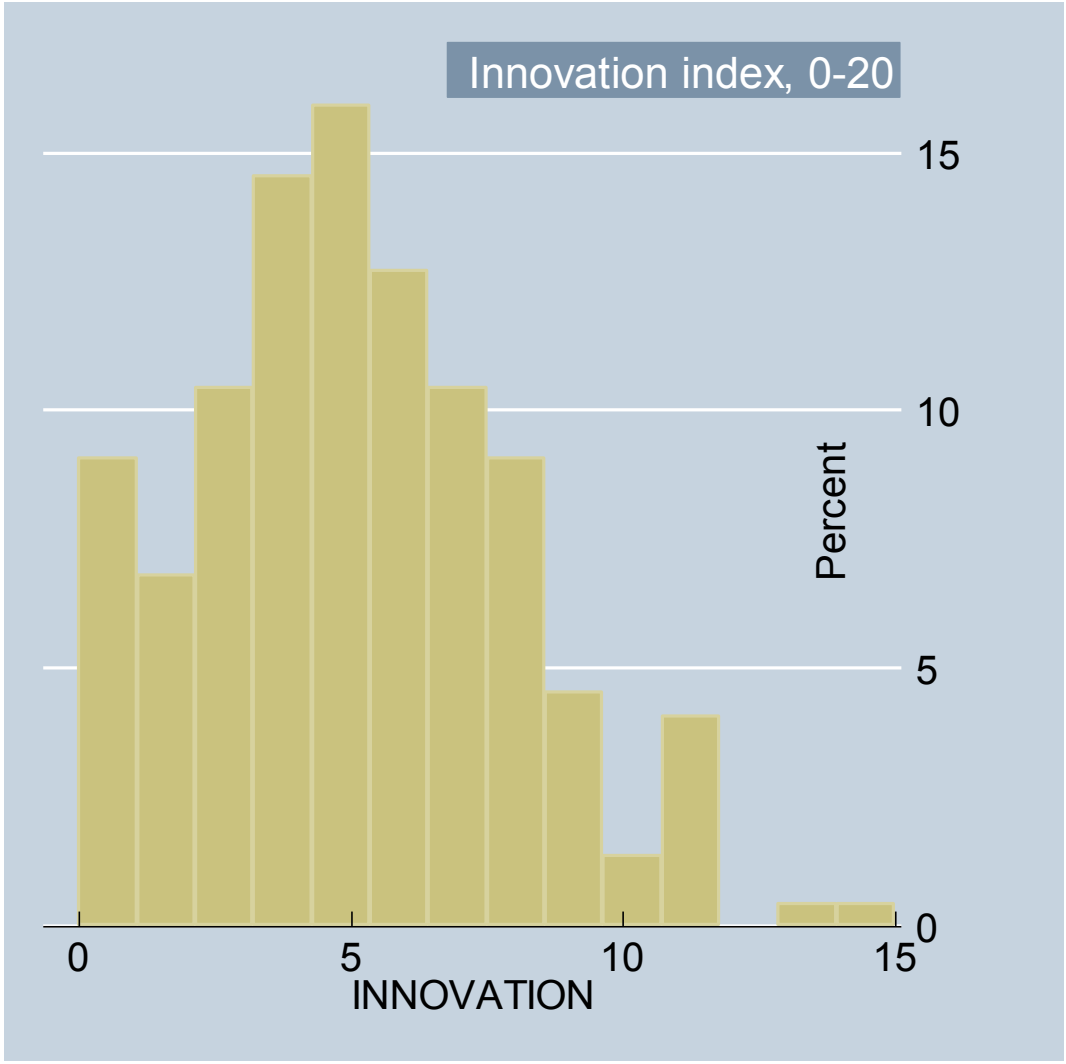
Milk production



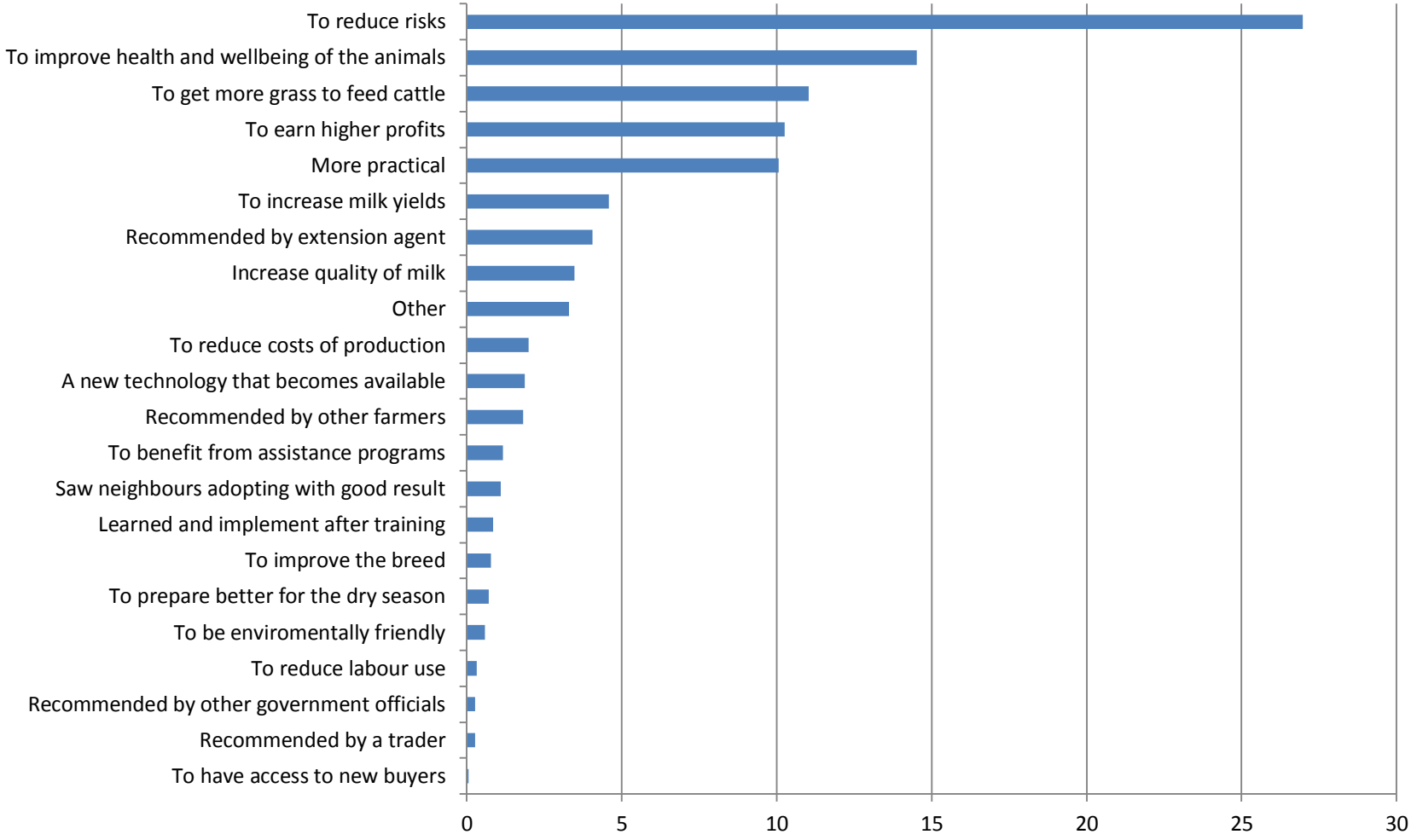
Innovations …

	Types of innovation
1	Artificial Insemination (AI)
2	Mastitis test
3	High protein concentrates (16% or higher)
4	Feed legume forages (e.g. Leucaena)
5	Use of any fertilisers for the grass
6	Grow new improved grasses (high yield)
7	Rubber/Plastic floor for the barn/cage
8	Teat dipping after milking
9	Improving drinking water availability 24/7
10	Conserving forages for the dry seasons (hay, silage)
11	Record keeping
12	Using detergents for milking equipment
13	Improved milking hygiene to reduce TPC
14	Automatic milking machines
15	Nutrient feed blocks
16	Cooling milk in water tanks
17	Stainless steel milking equipment
18	Biogas units
19	Milk pasteurisation
20	Milk processing (make yogurt)

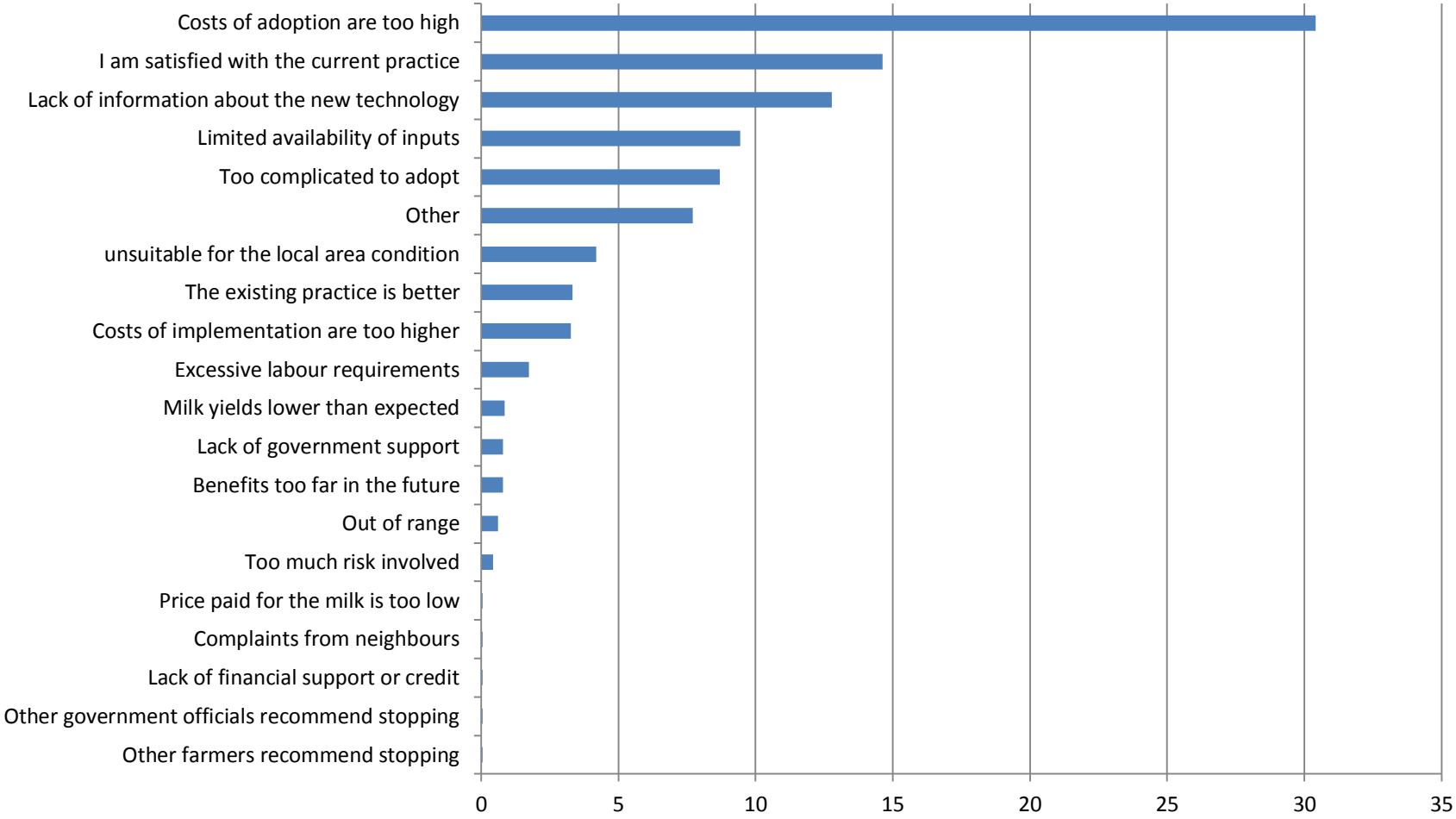
Innovation index



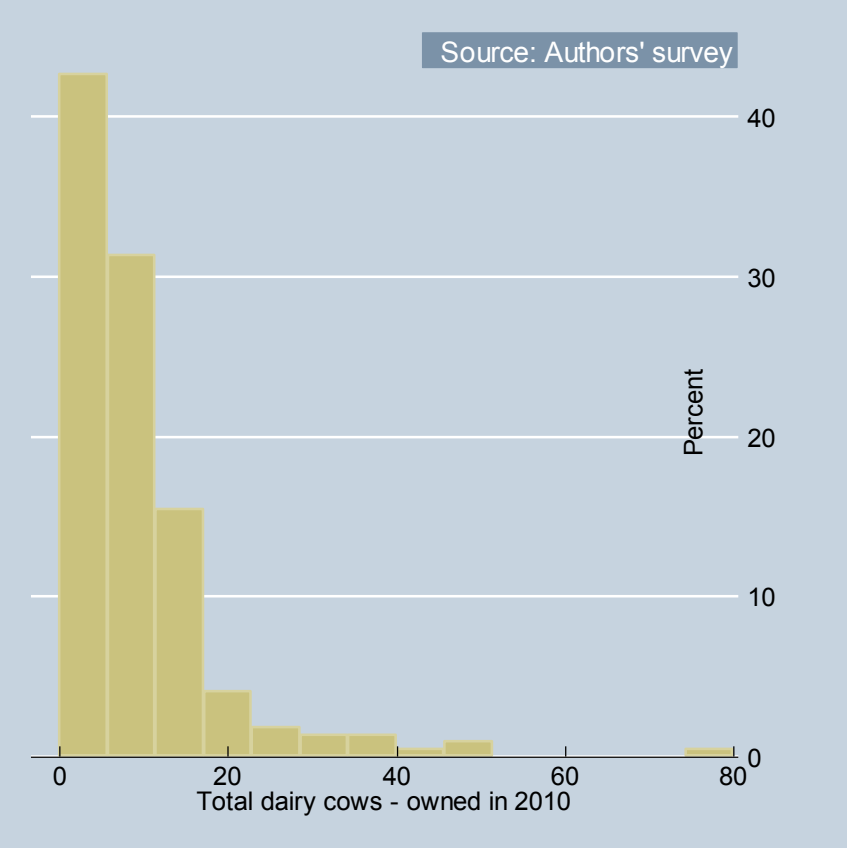
What are the main reasons you decided to adopt [...]?

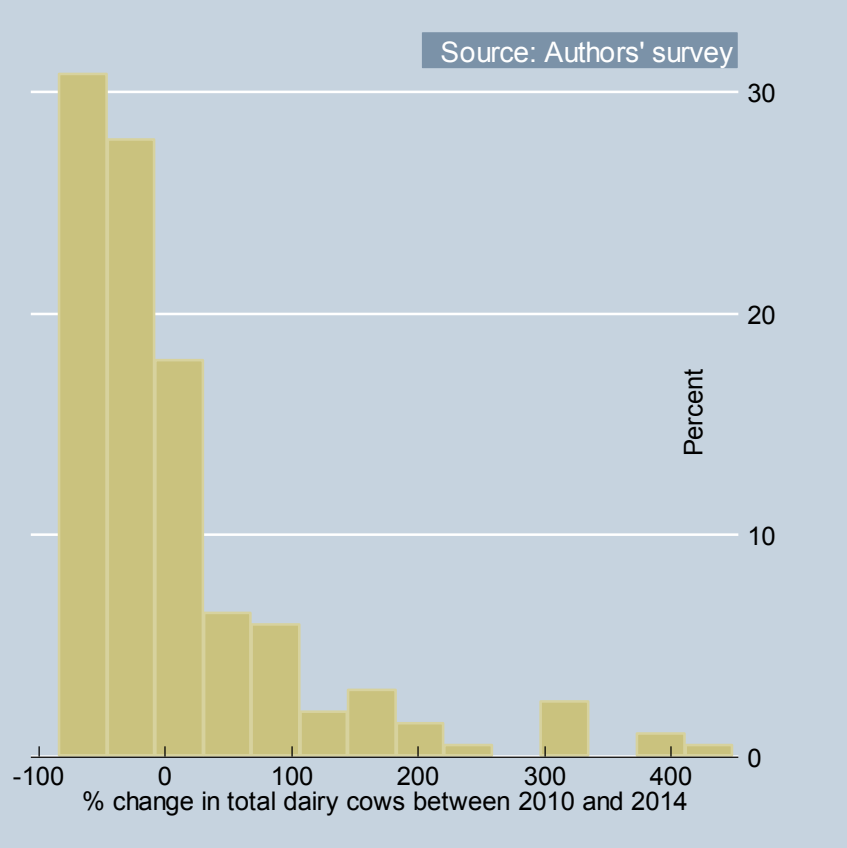


What are the main reasons you have not used/adopted or stopped using [...]?



Changes …


Source: Authors' survey
Percent
0
10
20
30
40
0
20
40
60
80
Total dairy cows - owned in 2010


Source: Authors' survey
Percent
0
10
20
30
-100
0
100
200
300
400
% change in total dairy cows between 2010 and 2014

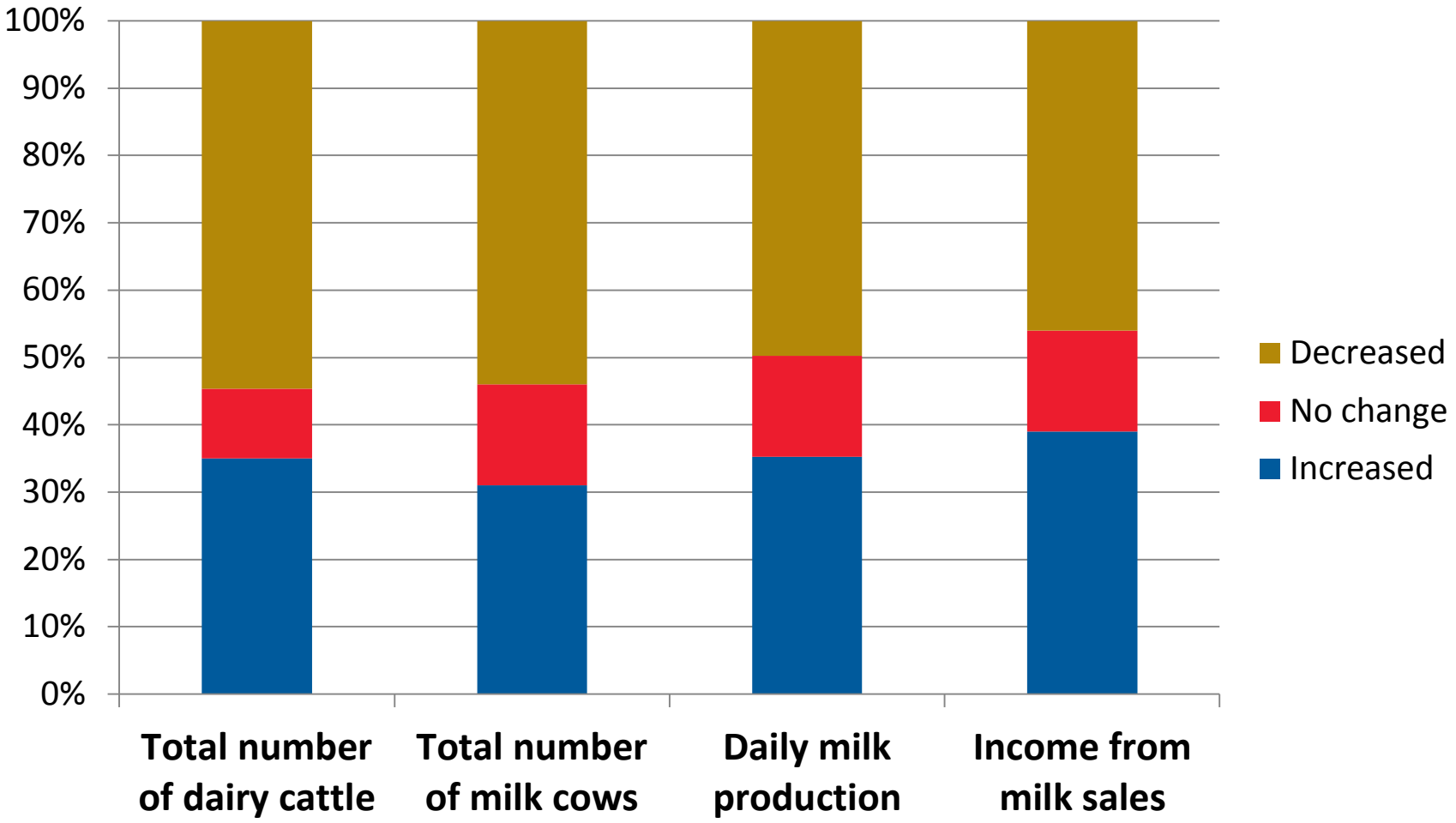
Changes …

Herd size in 2010	Herd size in 2014			Total
	<10 cows	10-30 cows	>30 cows	
<10 cows	**122**	**11**	**0**	**133**
	91.73	8.27	0.00	100.00
	79.22	25.00	0.00	66.17
10-30 cows	**31**	**27**	**2**	**60**
	51.67	45.00	3.33	100.00
	20.13	61.36	66.67	29.85
>30 cows	**1**	**6**	**1**	**8**
	12.50	75.00	12.60	100.00
	0.65	13.64	33.33	3.98
Total	**154**	**44**	**3**	**201**
	76.62	21.89	1.49	100.00
	100.00	100.00	100.00	100.00

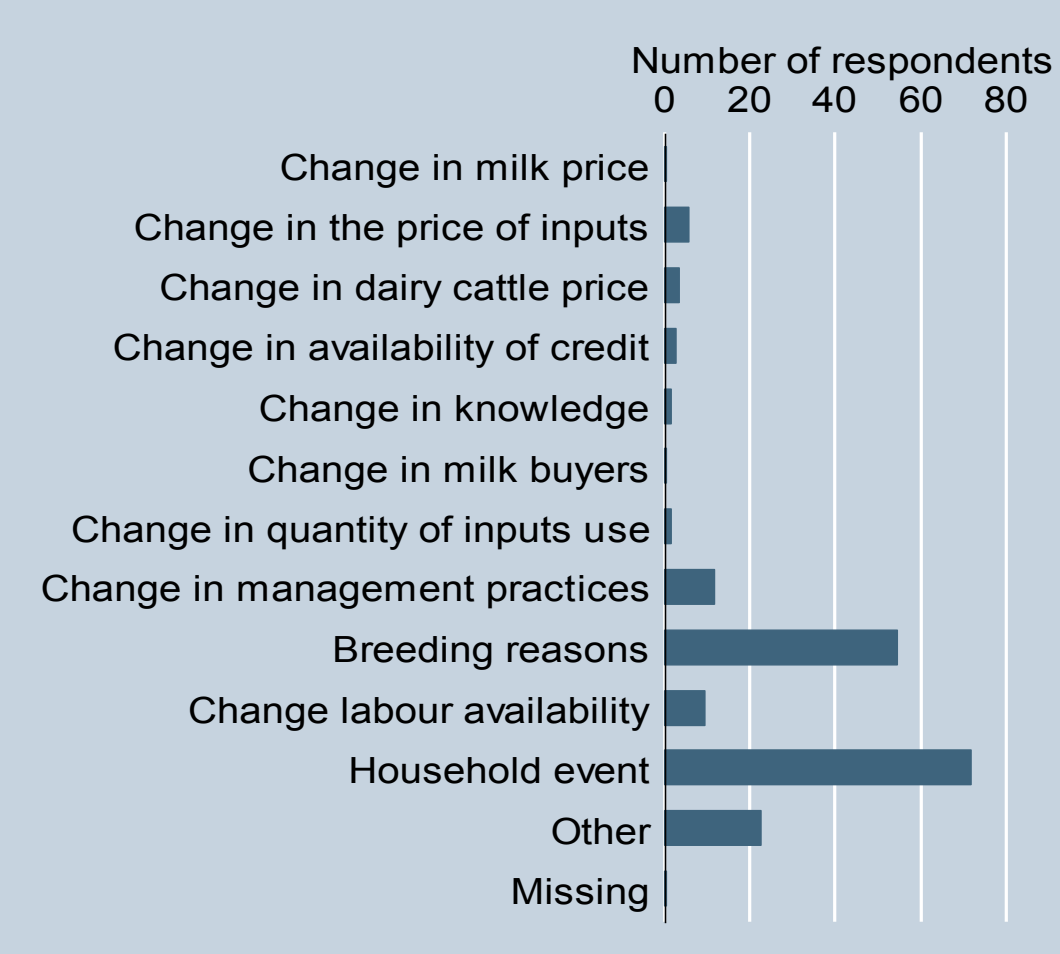
%Herd size change:

- ***<10 cows: 27.7%***
- ***10-30 cows: -31.6%***
- ***>30 cows: -46.3%***

Farmers' perception: "How has [...] changed since 2010?"



“What is the main reason to change in the total number of dairy cows?”



Determinants of herd size growth

- Initial herd size (-)
  - ie. small farms grow faster than large farms.
- Farm's age (-)
  - ie. young farms grow faster than old farms.
- Innovation (+)
  - ie. innovative farms grow faster than less innovation farms.
- Credits (-)
  - ie. farms that have coop as the main source of capital grow slower than those who do not have coop as the main source of capital.
  - Might mean difficulties to switch to another buyer that may offer premium price? This reliance can create some inefficiency in the event where cooperatives are not performing well and are not benefiting farmers.

Concluding remarks and caveat

- Farmers are heterogenous.
- Small, young, innovative dairy farms are growing faster than large farms.
- Financial dependence on cooperatives seems to impede farm growth.

Caveat:

- Our study can only observe farms who were active in 2014 (ie 'incumbents' and 'new entrants'); unable to capture dairy farmers who have completely left the industry.
  - This may explain why we observe increase in herd size among small farms.
- Unlike Jia et al. (2012), we are unable to derive variables that capture different levels of intensity of government policies.
  - Field observations suggest that government support in this sector has been quite minimal and there is no strong indication of regional difference in the delivery and intensity of public programs. Nevertheless, this issue needs further study.